

# Enhanced Delta Smelt Monitoring

## Preliminary Abundance Analysis

### Larval/Juvenile Lifestages

**DRAFT**

U.S. Fish and Wildlife Service

May 1, 2017

## Overview

As of April 2017, the Enhanced Delta Smelt Monitoring (EDSM) program has started sampling for larval and juvenile Delta Smelt. The Bay-Delta has been divided into four geographic strata:

- Western Low Risk, Low Density
- Low Risk, High Density
- High Risk
- Eastern Low Risk, Low Density

and each stratum has been further divided into two depth substrata:

- Deep Water (DW) zones with tidally averaged depths of 8 feet or more
- Shallow Water (SW) zones with tidally averaged depths of less than 8 feet.

Deep water sampling sites are generated using a generalized random-tessellation stratified (GRTS) design [1] with stratification and equal probability sampling. Each shallow sampling site is paired with a nearby deep water site, and sampling at the paired sites is carried out concurrently. Trawling gear similar to that used in the California Department of Fish and Wildlife's [20-mm Survey](#) is used to conduct two oblique tows at deep water sites, while a 1/3 scale version of the same gear without a sled is used to collect two samples in the top 2 1/2 feet of water at shallow water sites. Because of logistical constraints, only a subset of deep water sites have paired shallow water sites. This means that shallow water density and abundance estimates are based on few samples from a limited area within a geographic stratum.

Although deep water sampling sites are generated with a GRTS design, classic simple random sample (SRS) design-based ratio expansions are being used to calculate the abundance estimates and standard errors presented here. While the point estimates may be similar between the two sampling designs, the variances are expected to be different. Work to improve the methods used here is in progress. Size-selectivity of the deep and shallow water nets are accounted for using preliminary results from a gear selectivity analysis.

Everything presented here is preliminary and subject to correction, revision, and improvement. The following points should be taken into consideration when interpreting the results:

1. The **Week** designations used here were defined out of convenience and are subject to change.
2. The methods of analysis used here remain in development.

## Change Log

May 1, 2017

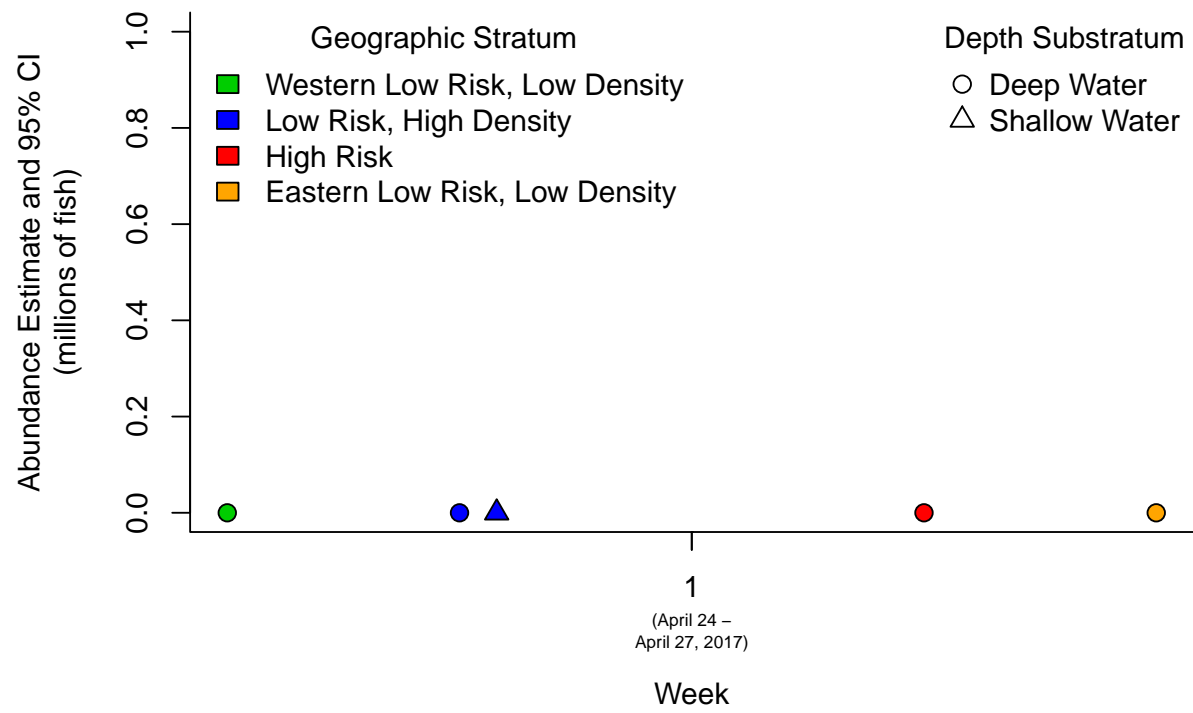
- Shallow water sampling in Week 1 involved gear and protocol testing and should be considered preliminary.

## Results

Table 1: Delta smelt catch summary and abundance estimates by week. An asterisk (\*) is used to emphasize weeks when no delta smelt were caught and a dash (-) is used to indicate that sampling did not occur or that a quantity could not be calculated. In order to avoid confusion, weekly abundance Subtotals and Totals are currently only calculated when sampling has occurred in all eight substrata.

				Estimate and 95% CI		
	Number of Sites	Number of Tows	Number Caught	Abundance	Lower Bound	Upper Bound
Week 1: April 24 - April 27, 2017						
Western Low Risk, Low Density						
Deep Water	3	6	0	0*	-	-
Shallow Water	0	-	-	-	-	-
Subtotal	3	6	0	-	-	-
Low Risk, High Density						
Deep Water	6	12	0	0*	-	-
Shallow Water	3	4	0	0*	-	-
Subtotal	9	16	0	0*	-	-
High Risk						
Deep Water	6	12	0	0*	-	-
Shallow Water	0	-	-	-	-	-
Subtotal	6	12	0	-	-	-
Eastern Low Risk, Low Density						
Deep Water	4	7	0	0*	-	-
Shallow Water	0	-	-	-	-	-
Subtotal	4	7	0	-	-	-
Total	22	41	0	-	-	-

### Delta Smelt Abundance Estimates Over Time



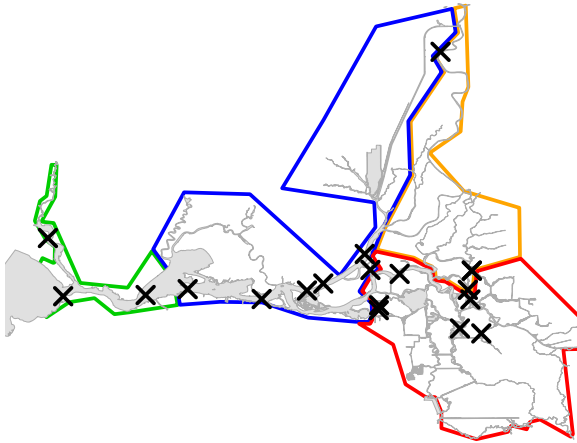
**Week 1 (4/24/17 – 4/27/17)**

19 deep water sites; 3 shallow water sites; 0 Delta Smelt total

**Delta Smelt Total Catch by DW Site**

Total Catch

X 0

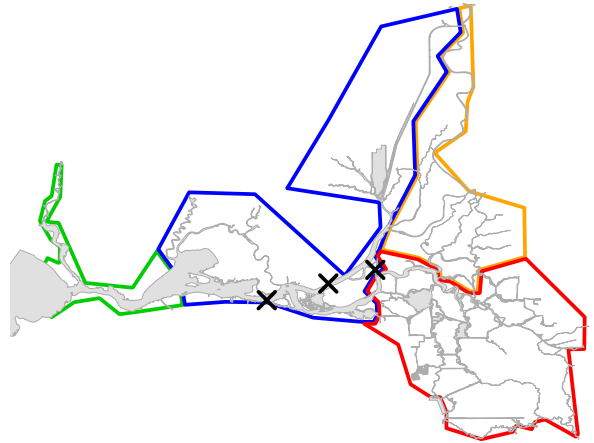


- Western Low Risk, Low Density
- Low Risk, High Density
- High Risk
- Eastern Low Risk, Low Density

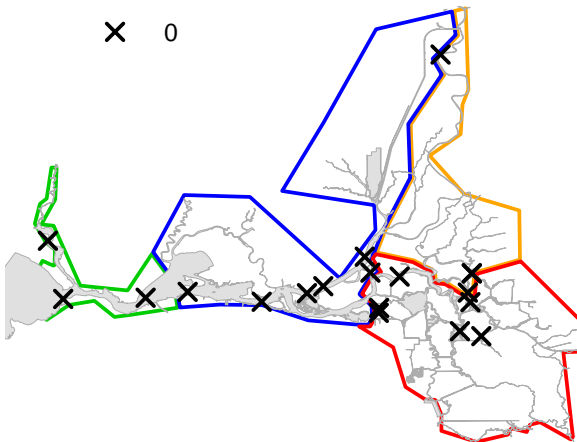
**Delta Smelt Total Catch by SW Site**

Total Catch

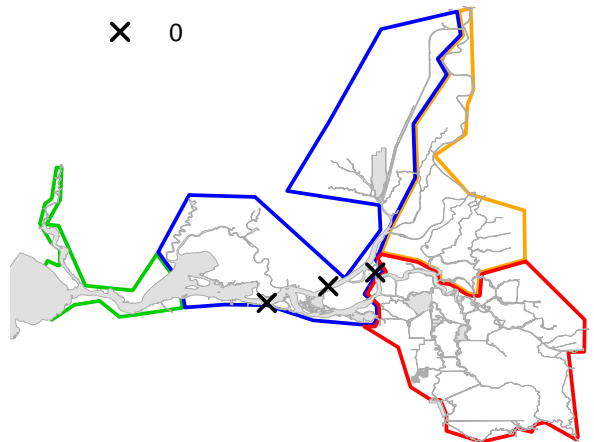
X 0

**Delta Smelt Catch Density by DW Site**Average Catch Density  
(fish per 10,000  
cubic meters)

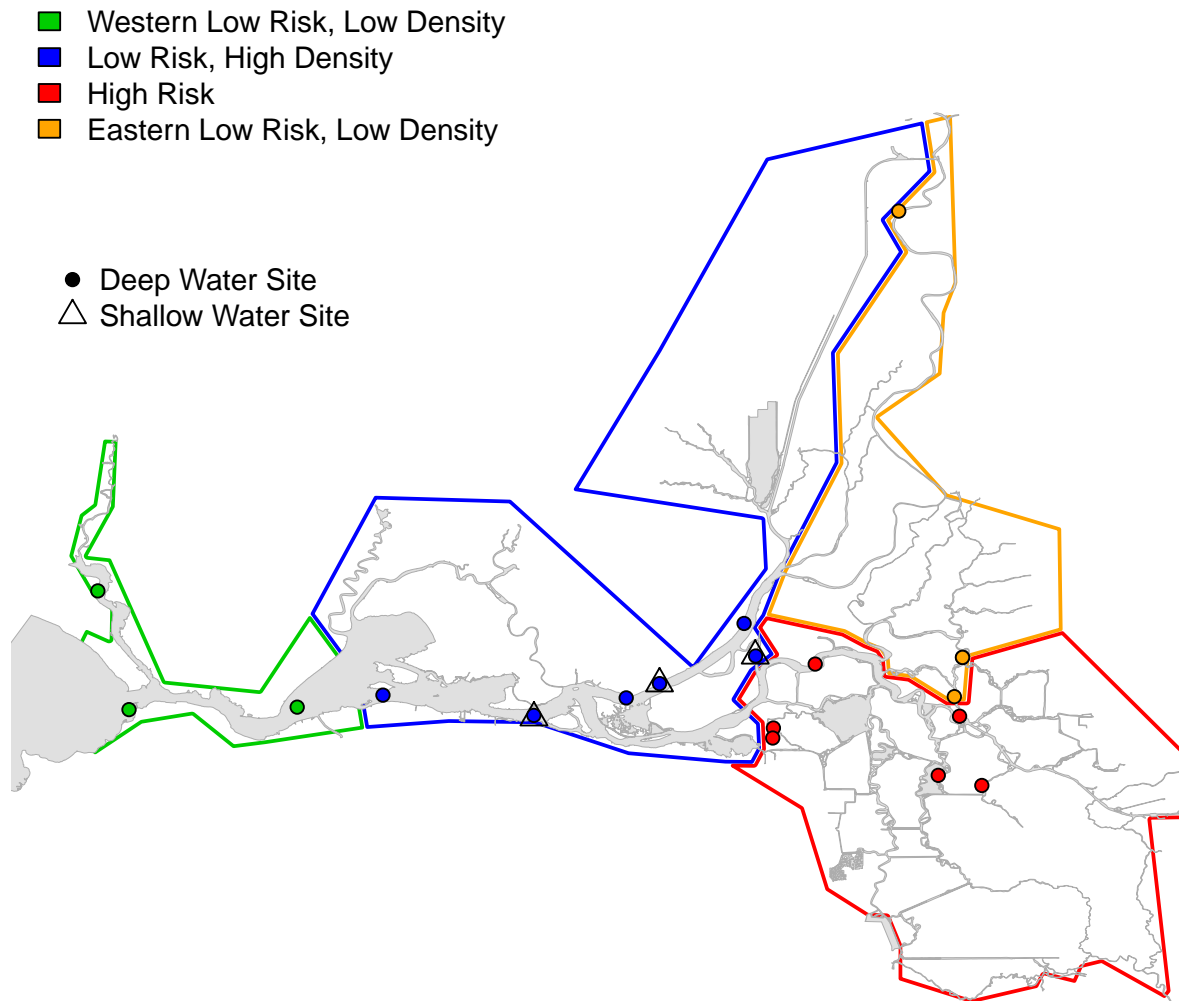
X 0

**Delta Smelt Catch Density by SW Site**Average Catch Density  
(fish per 10,000  
cubic meters)

X 0



## All Sampling Locations To Date



## References

- [1] Stevens, Don L., Olsen, Anthony R. 2004. Spatially balanced sampling of natural resources, *Journal of the American Statistical Association*, 99(465): 262 – 278.